

Applicant(s): Douglas LeCrone  
Serial No.: 09/966,639  
Filed: September 28, 2001

E30-052 (00-198)

REMARKS

This application was filed with claims 1 through 18. No claims were allowed. Claims 1 through 18 were rejected. Claims 1 through 10 12, 14, 17 and 18 are amended. Claims 1 through 18 remain in the application.

Applicant requests reconsideration and reexamination of the above-identified application in view of the amendments made to the specification and claims. The following remarks state Applicant's bases for making this request and are organized according to the Examiner's Action by paragraph number.

Examiner's Action, Paragraphs 1 through 3

The Examiner rejects claims 1 through 18 under 35 U.S.C. 112, second paragraph stating that "claims 1 and 10 are misdescriptive because the claims recite that the determination of operating validity is done during normal operation and also during an address switch". The Examiner questions the intent of these limitations, the meaning of "normal operation" and any distinction between the "determination" and "verification" steps and apparatus. Further, the Examiner argues that "operating validity" is vague and that claim 10 includes the phrase "said method comprising" in what appears to be an apparatus claim.

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Applicant respectfully traverses these rejections in view of the amendments to the claims made to clarify any confusion with respect to the meaning of the terms and claims.

As amended the claims to more clearly distinguish the step of determining operating validity and the step of verifying operating validity. Specifically the determining step of claim 1, paragraph A) and the determination means of claim 10, paragraph A) operate before any attempt to respond to the swapping command. Thus any such determination is made while the first plurality of logical devices continue to respond to I/O requests and while the second plurality of logical devices mirror the first plurality of logical devices. This process is a "prevalidation process". The process can occur at any time and can be repetitive. The determination step or means provides an indication whether a valid swap operation can occur or could have occurred at the last operation of the determination step or means.

The verification step or means of claims 1 and 10, respectively, responds to an initiation of an address switch in response to a swap command. Now it is merely necessary for the verification to determine if the last determination step or means indicated that a valid operating condition existed with respect to the first and second plurality of logical devices. If this validation occurs, then the swapping operation occurs.

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Thus, Applicant believes that claims 1 and 10 as amended more clearly define the difference between normal operations and the operation in response to a swap command.

Claim 10 defines a step for determining an "operating validity". This determination could be based on any of a variety of conditions. The specific definition of those conditions will vary with each specific implementation of this invention. FIG. 6 and related discussion define one specific set of conditions. A determination for a specific implementation will be dependent upon that implementation. The definition of the specific operation conditions will be well within the capabilities of a person of ordinary skill in the art. Consequently, Applicant respectfully submits that the phrase "operating validity" is clear and need not identify any specific operating parameters.

Claim 10 is amended to overcome the unintentional inclusion of "said method comprising".

Examiner's Action, Paragraphs 4 and 5

The Examiner rejects claims 1 through 18 under 35 U.S.C. 102(e) as being anticipated by U. S. Patent No. 6,304,980 to Beardsley et al. (hereinafter the "Beardsley patent"). The Examiner argues that the Beardsley patent discloses the use of first and second groups of pluralities of

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logical devices for mirroring, the existence of an identifying control block, testing of the operating validity to determine if a particular condition exists, an initiation of an address switch by verifying the operating validity by exchanging the information each control block associated with the first and second logical devices whereby subsequent I/O requests are diverted to the second group of logical devices.

The Examiner further rejects claims 2, 3, 11 and 12 because the Beardsley patent discloses an asynchronous and independent exchange of control block information.

Claim 4, 5, 13 and 14 are rejected over the Beardsley patent because the Beardsley patent teaches a response of operating modes to a change in configuration.

Claims 6, 7, 15 and 16 are rejected because the Beardsley patent discloses a determination of validity for each logical device in a first group including a data structure validity flag set in response to validity determination.

Claims 8, 9, 17 and 18 are rejected because the Beardsley patent discloses the exchange of information while all the logical devices have been blocked for responding to any I/O request and being released after the exchanges are made.

Applicant respectfully traverses these rejections.

The Beardsley patent is a continuation-in-part of U. S. Patent No. 5,870,537 to Kern et al. for a concurrent switch to

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shadow device for storage controller and device errors. Applicant describes the Kern et al. patent beginning at page 5, line 8 of the application. Referring to FIG. 10 of the Beardsley patent, a failure in a device attempts to stop all I/O to the primary device before invoking a device swap. As shown in FIGS. 11 and 11A, the device swap includes determining the status of various remote duplex pairs as shown by steps 1110 and 1120, testing various parameters in steps 1130 and 1131, establishing a relationship in steps 1140 and 1150, suspending remote copy in step 1160 and then comparing device characteristics in step 1170. Only after all these steps have been performed does step 1190 update the control blocks. If the swap is successful then I/O requests can continue. Consequently all the foregoing testing occurs while I/O requests are blocked from accessing the data storage facilities.

Applicant's invention, as defined in claims 1 and 10, performs necessary testing to assure that the operating conditions at both the first and second pluralities of logical devices occurs "prior to" the swapping operation while normal operations are continuing with the host sending I/O requests to the primary storage devices and then having those requests relayed to the secondary storage devices. There is no significant interruption of normal operations of the data

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processing system during these determinations. Therefore when it is necessary to initiate an address switch, it is merely necessary to verify that the last determination indicates that the first and second pluralities of logical devices have a valid operating mode. In one embodiment disclosed in the application, this is the step of testing the GV bits 252 in the data structure 245 of FIG. 3. Other implementations will be apparent to those skilled in the art. The swap then occurs. This approach of prevalidating the configuration of the first and second pluralities of logical devices prior to the initiation of an address switch greatly reduces the time I/O requests are blocked.

Claims 2, 3, 11 and 12 define a specific embodiment of this invention in which the determination of the operating validity occurs asynchronously and independently of the exchange of the control block information. This is Applicant's prevalidation concept. Nothing in the Beardsley patent discloses or suggests such an asynchronous and independent prevalidation operation as the validation in the Beardsley patent occurs during an actual swapping operation. Claims 12 and 13 indicate that this prevalidation operation can occur at different times prior to the address switching function being initiated.

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Claims 4, 5, 13 and 14 define specific implementations of the invention as set forth in claim 2. Applicant believes that these are claims of varying scope to which Applicant is entitled.

Claims 6, 7, 15 and 16 have narrower scope than claim 2 and are particularly directed to an implementation in which the operating validity for each of the first logical devices in a group and corresponding logical devices in the second plurality of logical devices are tested and, in accordance with claim 7, in which the test sets or clears a validity flag. Applicant sees nothing in the Beardsley patent that discloses or suggests such an implementation in the context of the invention set forth in claim 2.

Claims 8, 9, 17 and 18 define the specific steps implemented to obtain a consistent exchange of data when a plurality of logical devices are involved. Applicant sees nothing in the Beardsley patent that discloses or suggests this type of operation in the context of claim 7.

Examiner's Action, Paragraph 6

Applicant has reviewed U. S. Patent No. 6,484,187 to Kern et al. and U. S. Patent No. 6,526,419 to Burton et al. Applicant sees nothing in these references that discloses any

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material that is more relevant than the Beardsley patent or other prior art of record in this case.

Amendment to the Specification and Drawings

Applicant is making several amendments to correct some minor errors in the specification.

Applicant is correcting one error that would have been obvious to a person of ordinary skill in the art. Specifically the attached Amendment to the Drawings reroutes the "N" output from step 261 in FIG. 4 to step 263, rather than to step 266. A corresponding change in the reference numeral, is included in the specification. Applicant submits that this change does not constitute the addition of new matter and is apparent given the context and other statements made in the application. For example, page 17 indicates that the "N" branch from step 261 indicates there is no validation argument. Given the disclosure, valid swap commands include a "prevalidation only" command, a "swap only command" and a "prevalidation and swap" command. At page 17, line 14 the operation is defined as transferring control to "step 266" that should be "263". The following sentence discusses an alternative in which the test of step 261 is combined with the test of step 260. The next following sentence says that if step 263 determines that the group is invalid, and that is the step to which the arrow has



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changed, control transfers to step 266. Thus Applicant believes that in the context of the disclosure this change does not represent the addition of new matter, but merely corrects an error that would have been obvious to a person of ordinary skill in the art.

Summary

Applicant has amended the specification and claims to more clearly define Applicant's invention. Applicant respectfully requests the Examiner to reconsider the rejection and to allow claims 1 through 18 as amended because of each of these claims defines a method or apparatus that is novel and would not have been obvious to a person of ordinary skill in the art at the time Applicant made his invention.

If there are any questions, we urge the Examiner to call us collect.

Respectfully Submitted,



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